33rd Annual INCOSE international symposium

hybrid event

Honolulu, HI, USA
July 15 - 20, 2023

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Think Like An Ecosystem: Transitioning Waste Streams to Value Streams

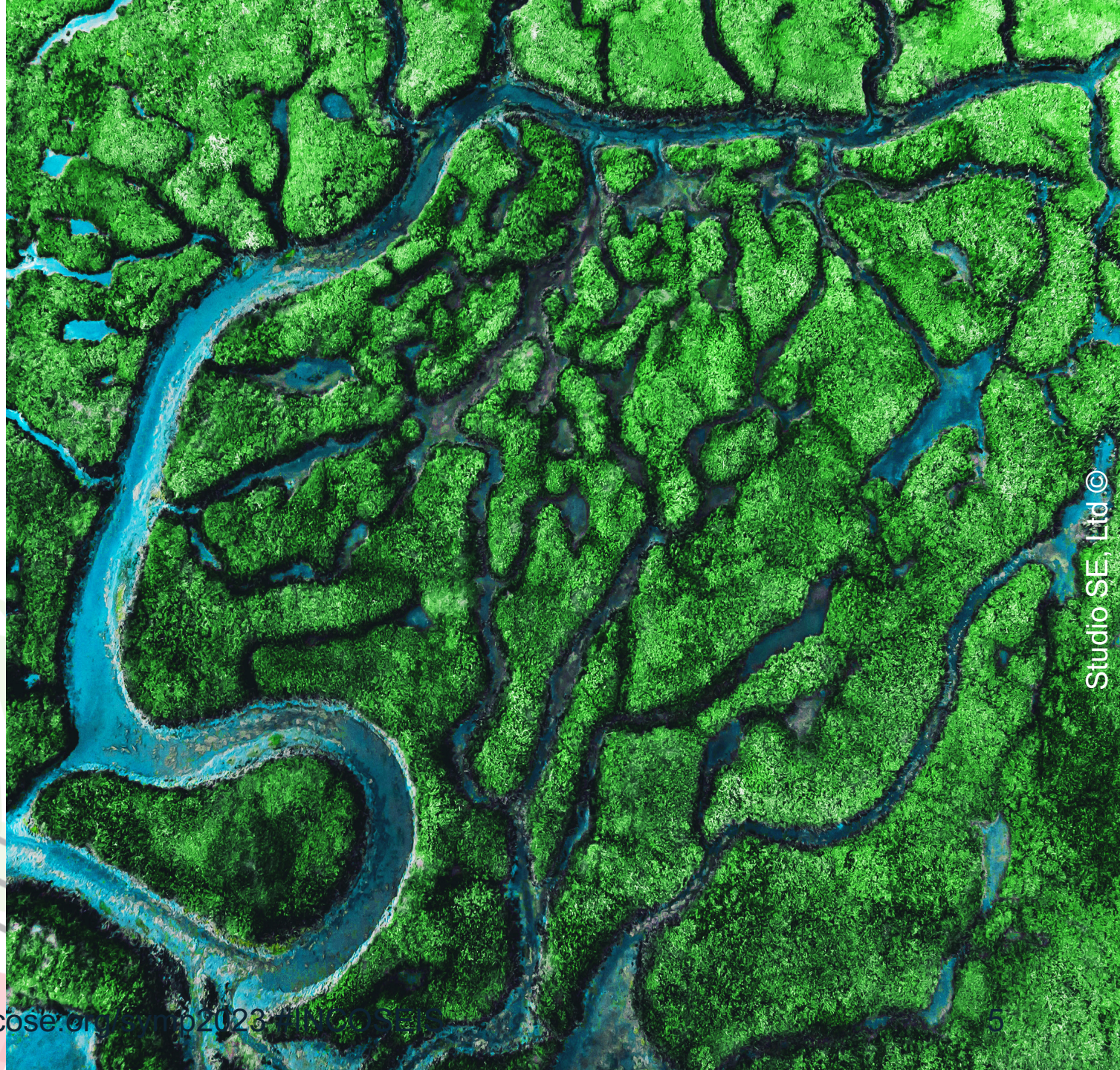
2,010,000,000

70%

The 4 Laws of Ecology

Law I: There Is No Such Thing As A Free Lunch

Selection Pressure



Law II: Nature Knows Best

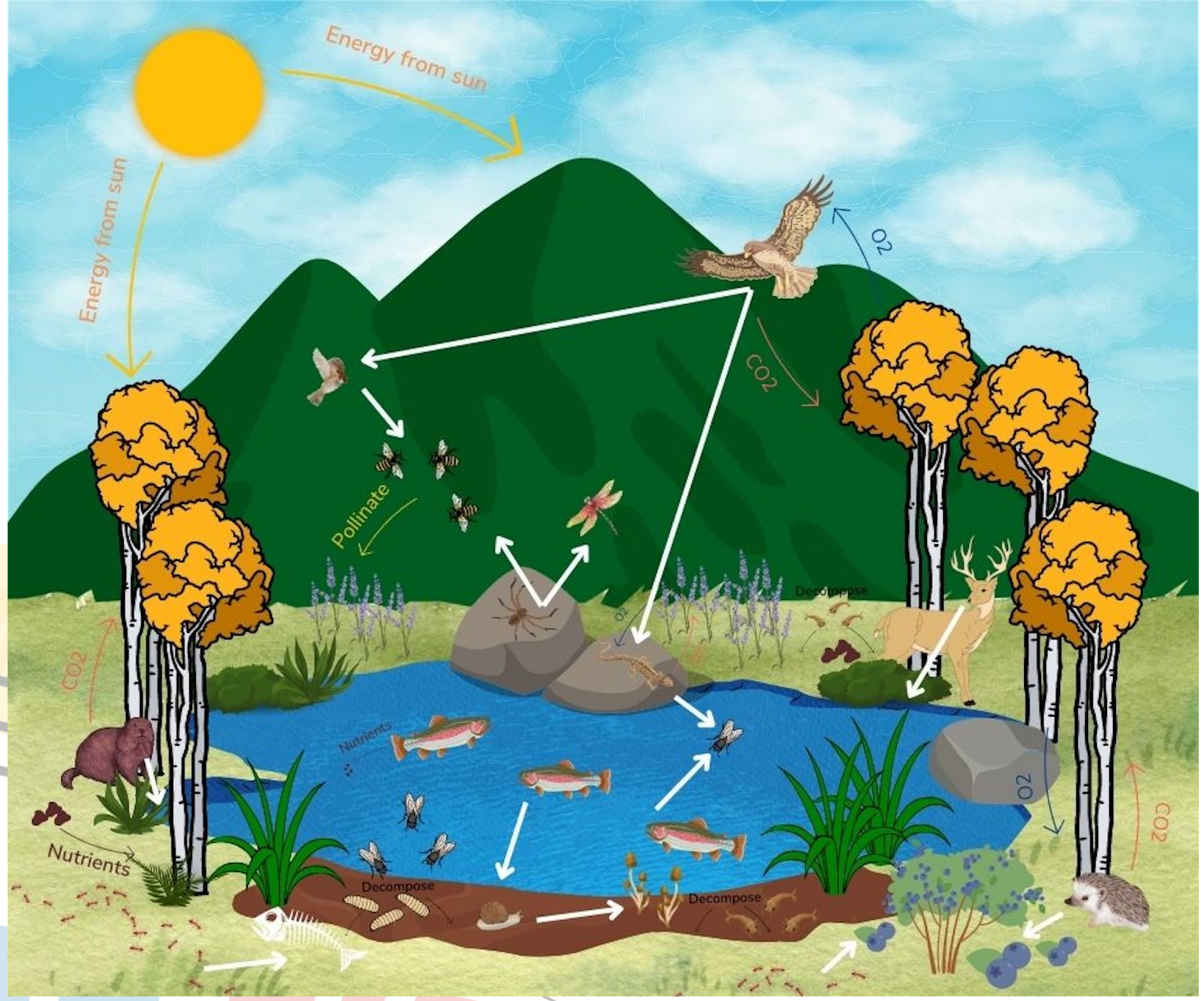
Constant Adaptation

Law III: Everything Is Connected To Everything Else

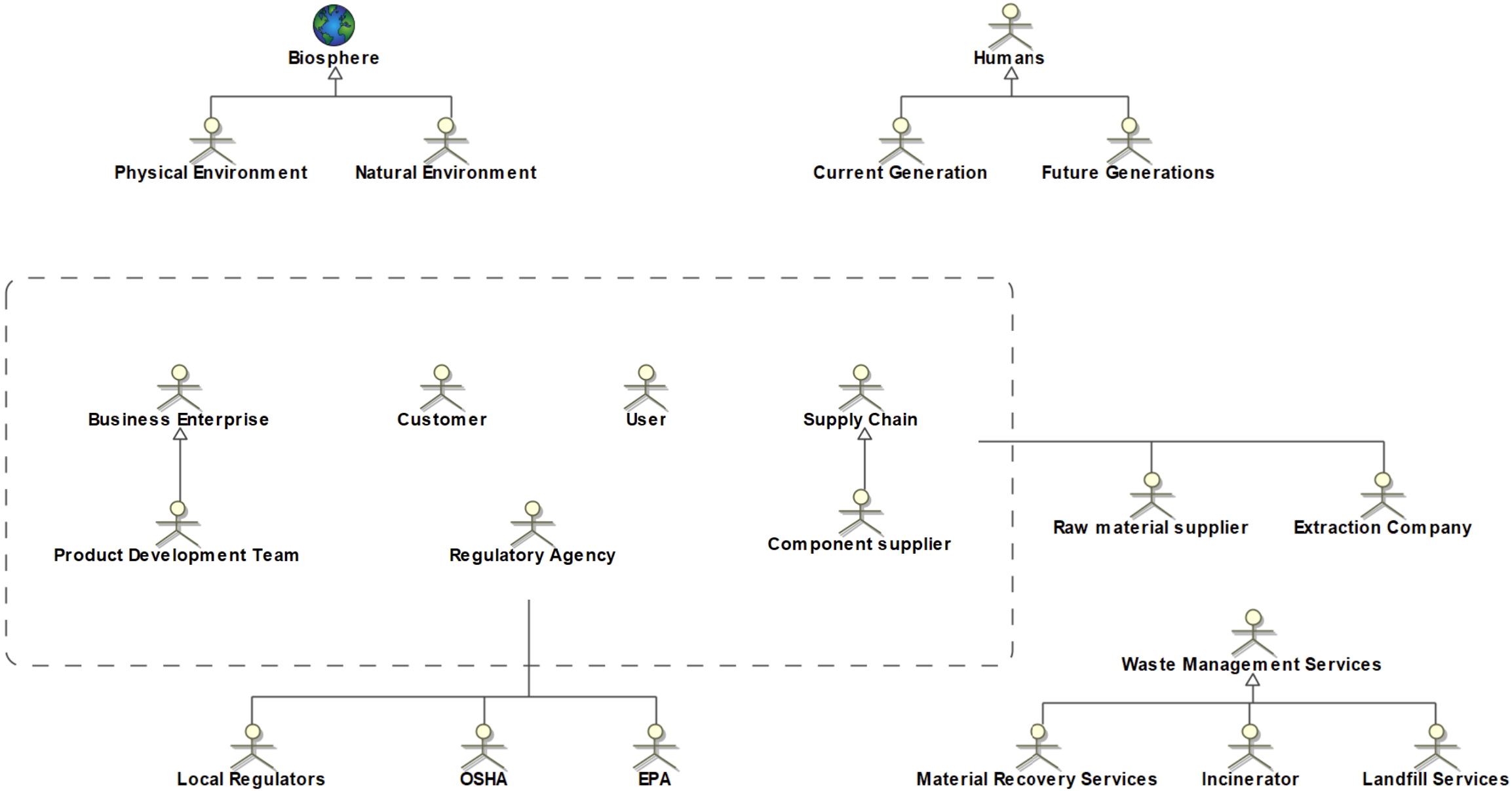
Causal Complexity

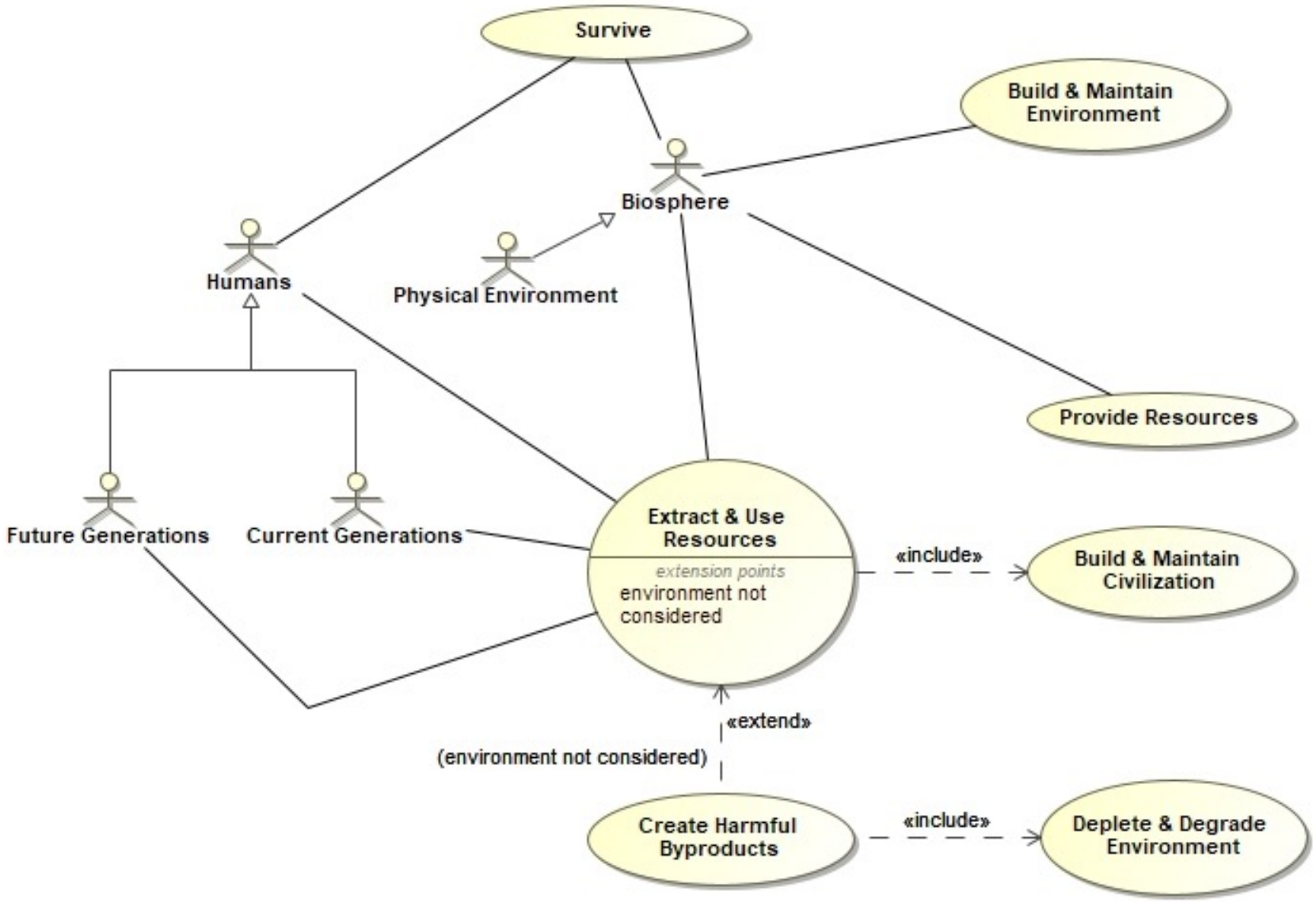
Law IV: Everything Must Go Somewhere

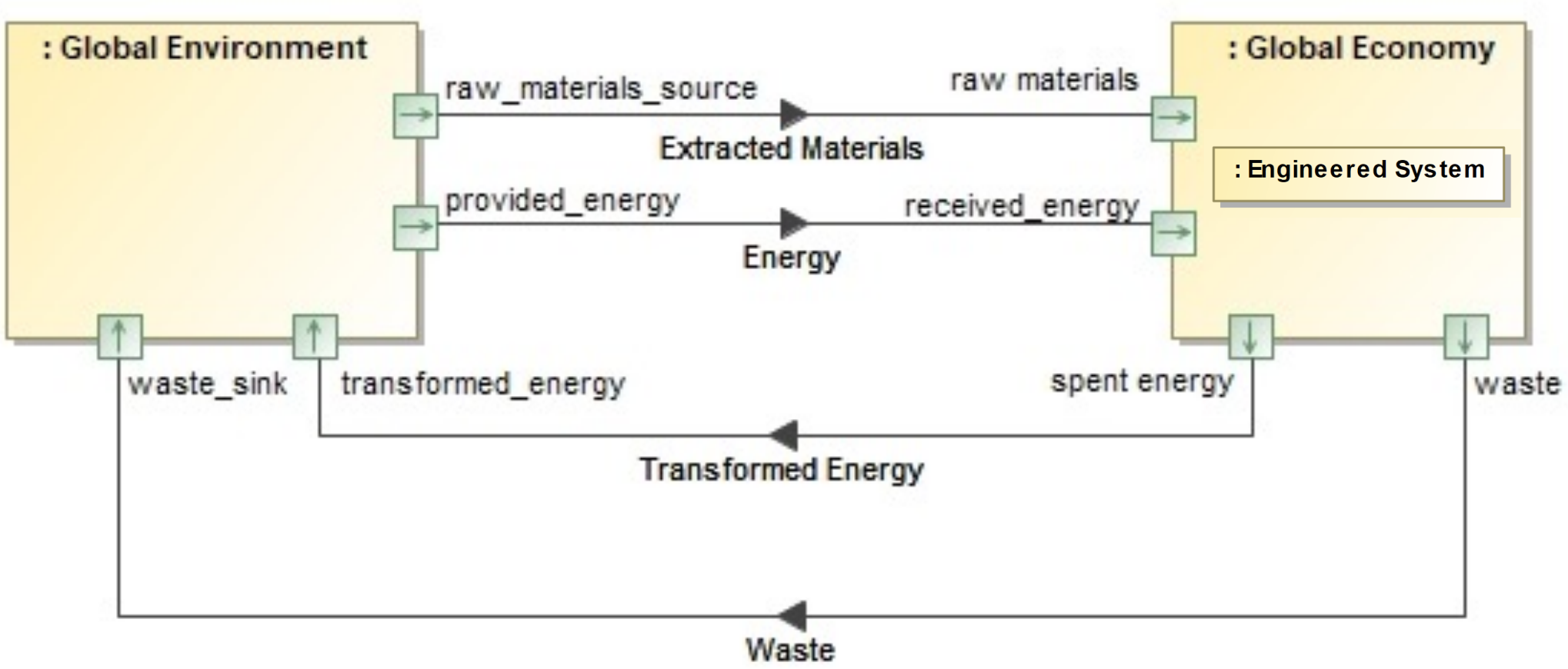
Inclusive System Boundaries



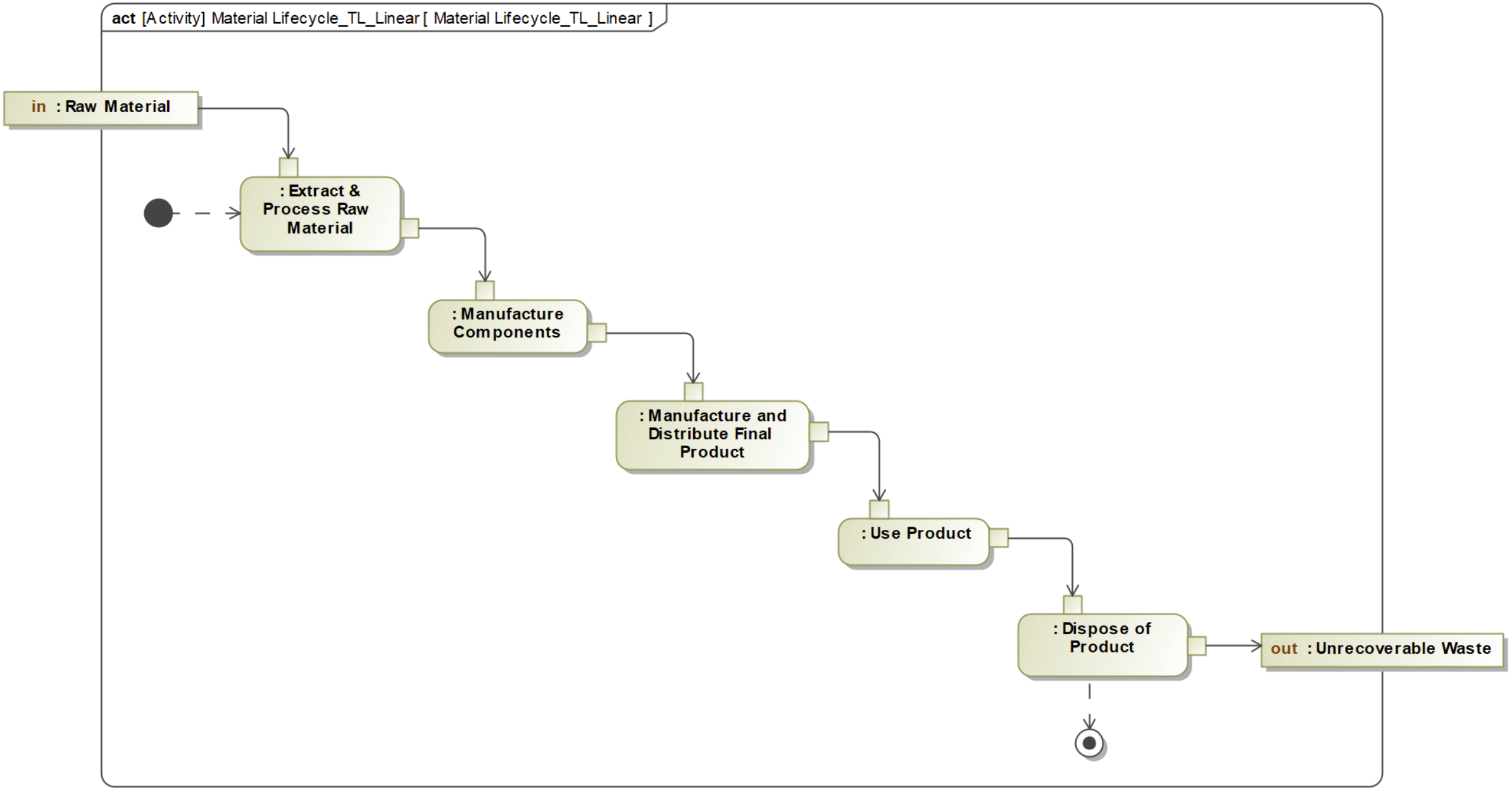
Credit: llandscapes-ee1

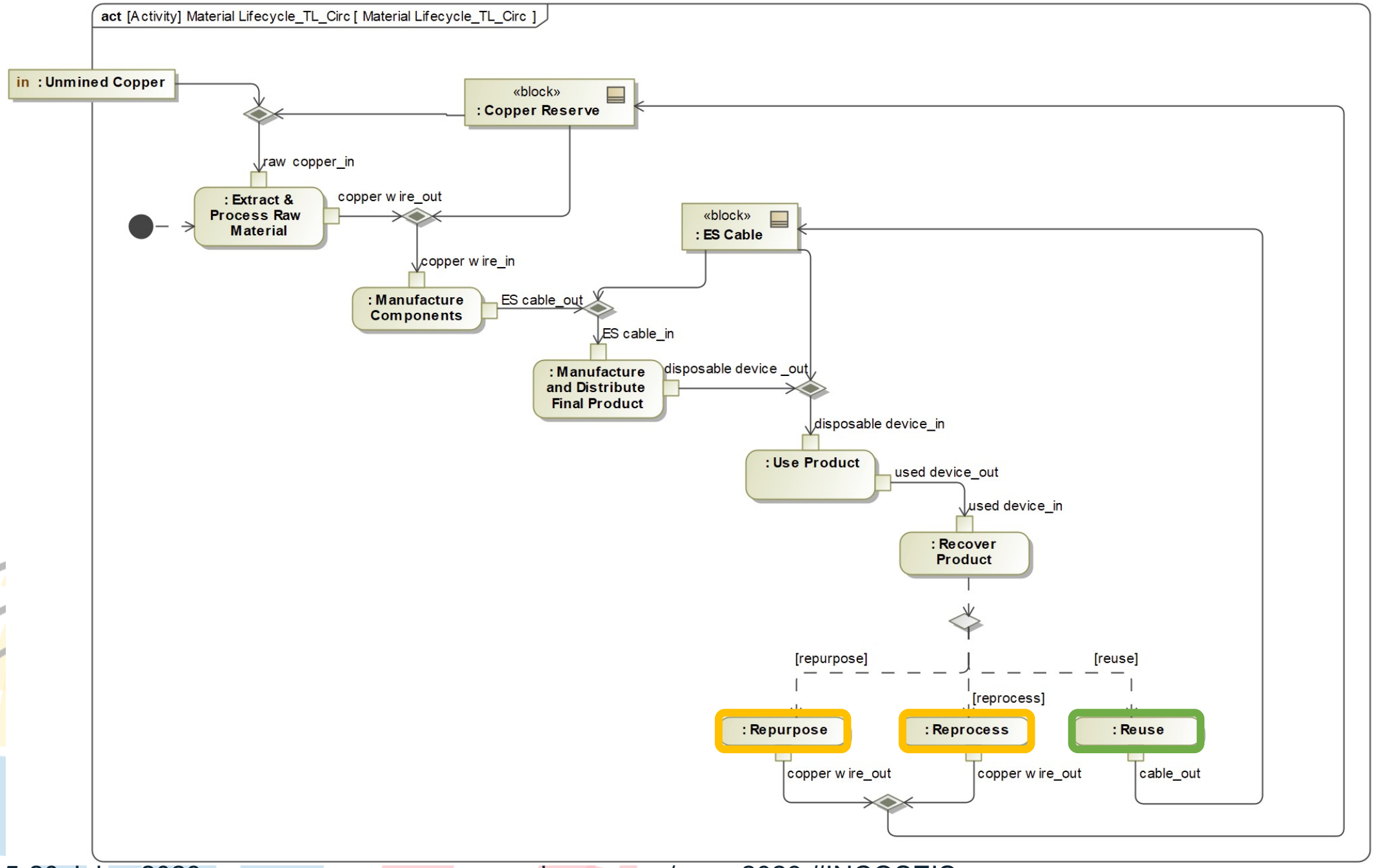


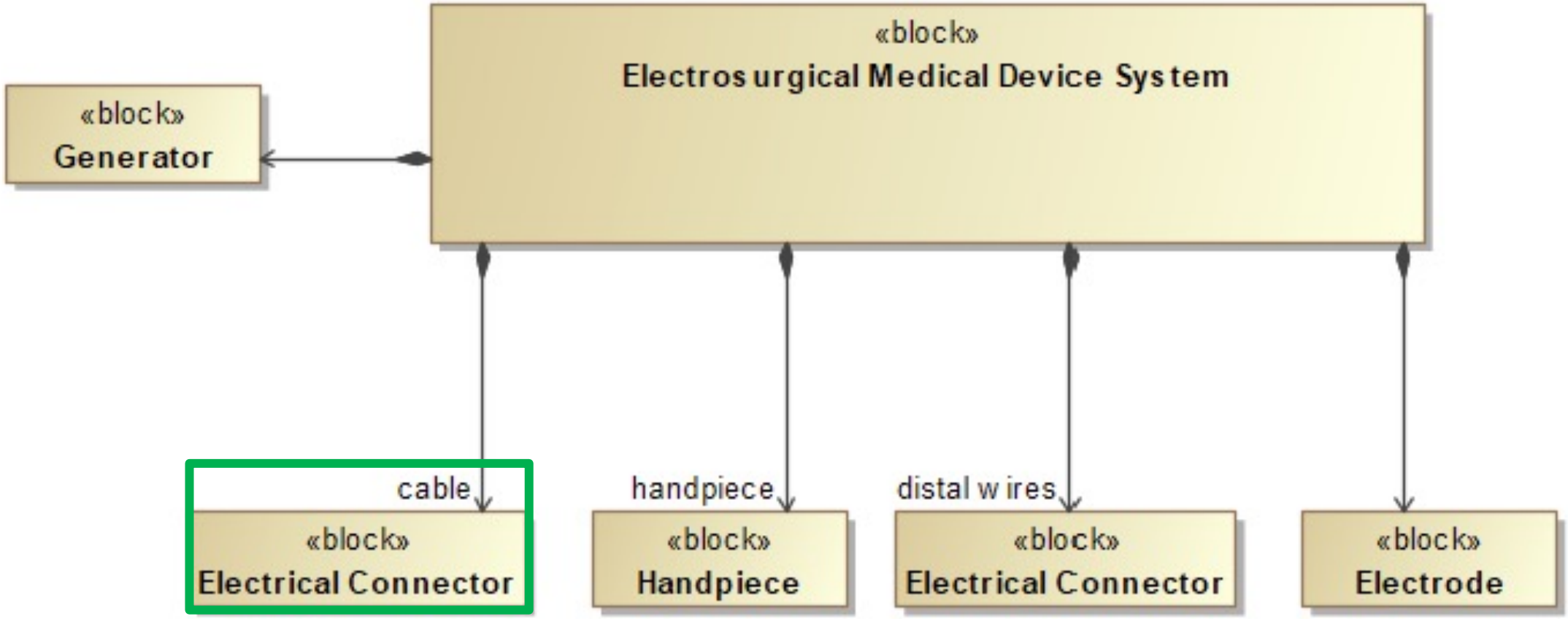


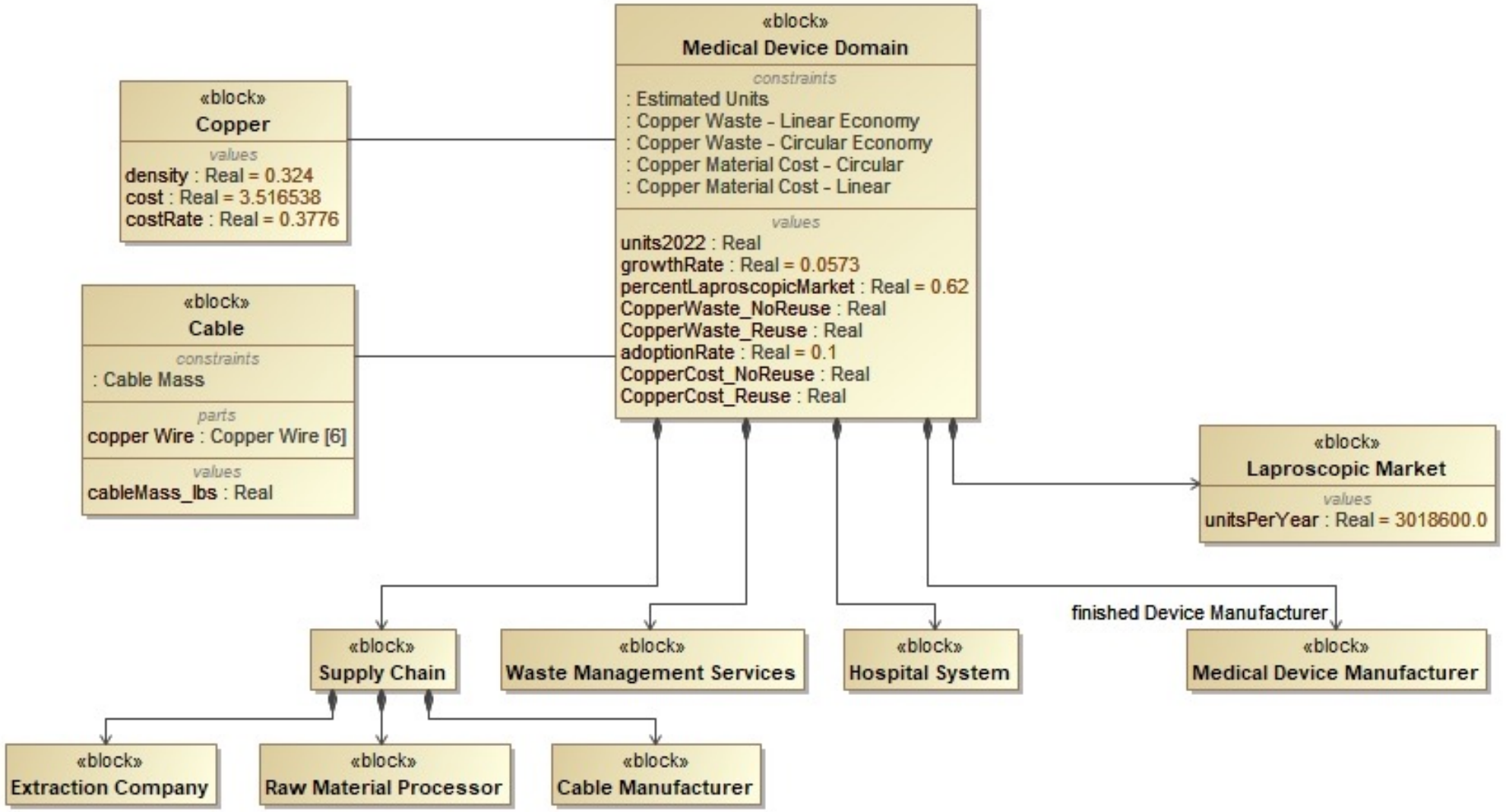


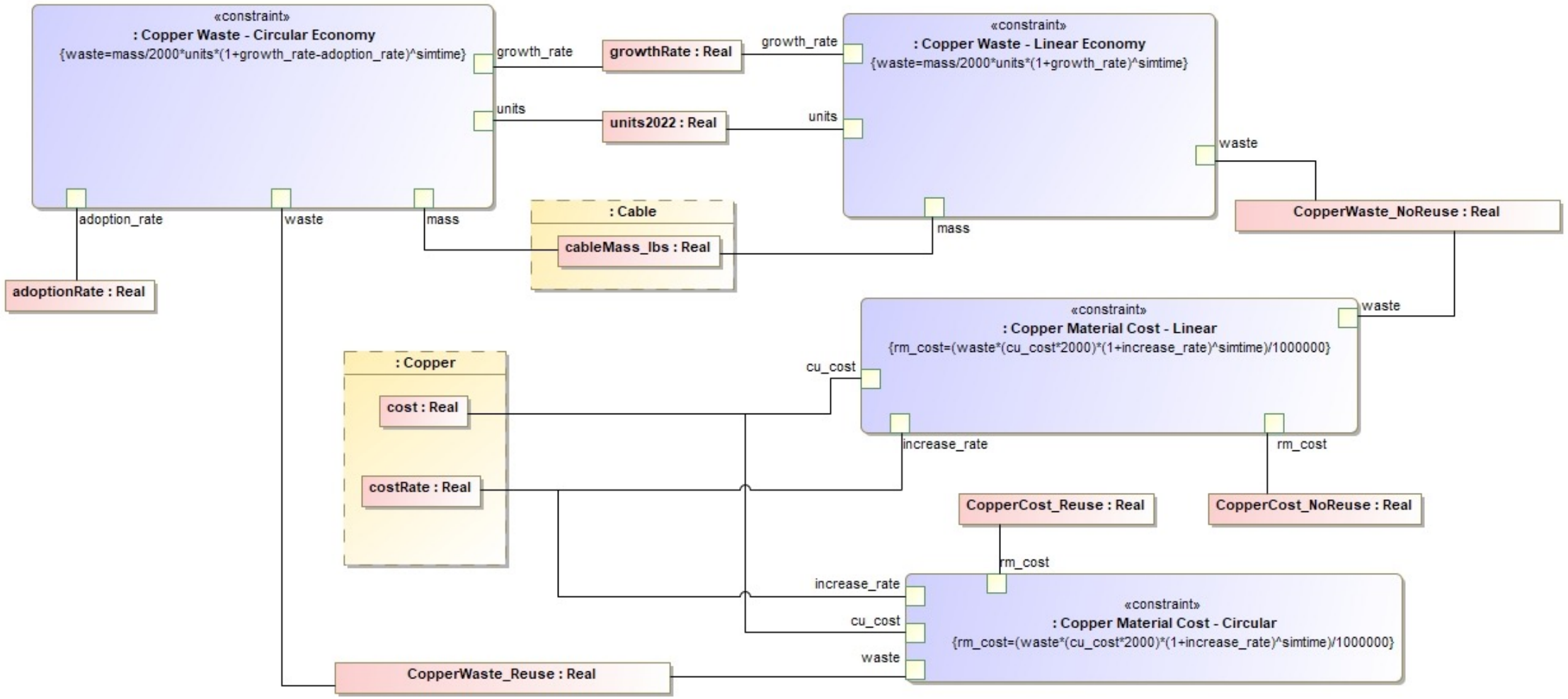
Copper Cycles in Medical Devices

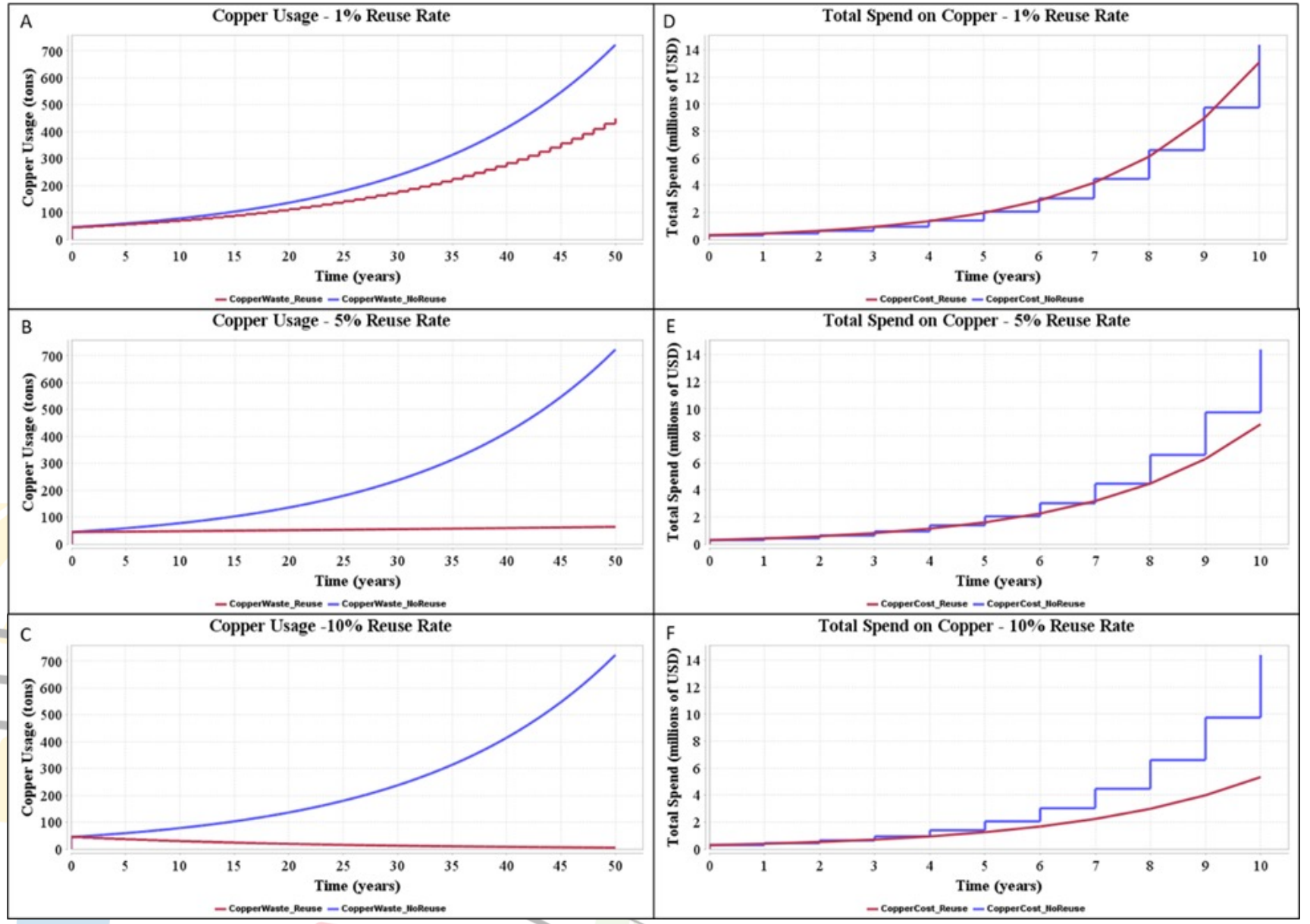












Closing the Waste & Resource Loop

What can I do as a Systems Engineer?

- Identify environments as stakeholders in early stakeholder identification and research.
- Expand system scope and boundary analyses to ensure interfaces with sources and sinks are considered.
- Explicitly identify raw material suppliers and waste handlers as stakeholders.
- Using the newly identified stakeholders listed above, ensure those stakeholders' needs are correctly and adequately transformed into system requirements.
- Include environmental considerations in material and production process selection trade studies.
- Include sources and sinks as references in manufacturing models such that interfaces can be described and the impacts of material selections and production methods on environmental interfaces can be assessed.

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www.incose.org/symp2023
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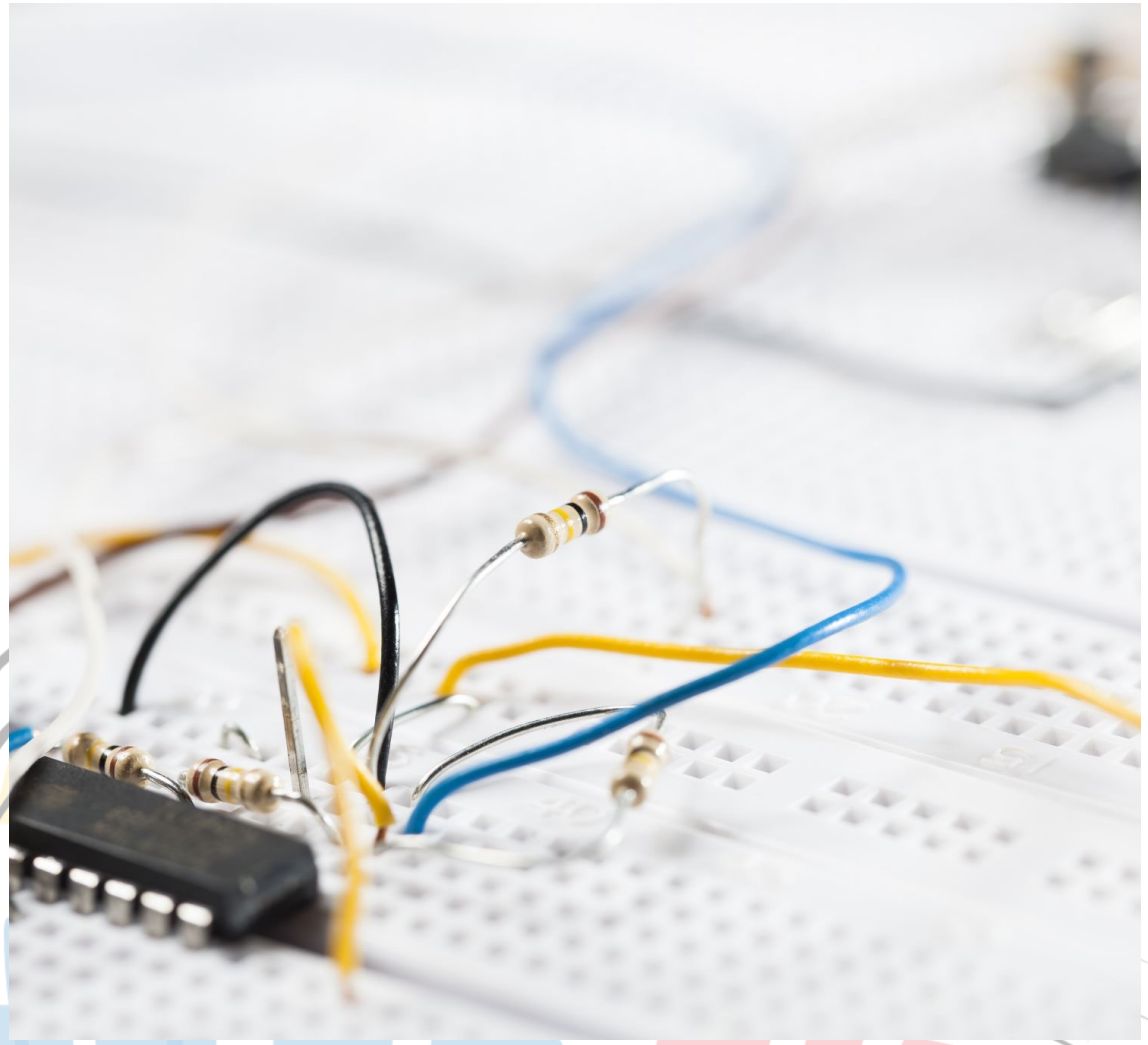
Questions?

Applying SE Knowledge



Causal complexity: The characterization of the impact of interactions among and between systems and their interfaces is a foundational concept in systems engineering.

Adaptability: The resilience of engineered systems, production mechanisms, supply chains to consider future states and plan for the inclusion of circular design.

Inclusive system boundaries: Recognizing environments and environmental factors as stakeholders of our system, we expand our scope of practice to ensure our design decisions properly capitalize on opportunities to include elements of circularity.

Selection pressure: Actively considering environmental factors, systems engineers can apply pressure to vendors and suppliers to source materials and components from increasingly circular sources. This work begins with appropriately inclusive requirements.

Circular Economies